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Nowakocoenia cieszynica gen. et sp. nov. (SCLERACTINIA) AND ITS BARREMIAN–APTIAN AGE BASED ON DINOCYSTS (POLISH OUTER CARPATHIANS)

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Abstract: A colonial scleractinian coral *Nowakocoenia cieszynica* gen. et sp. nov. (suborder Stylinina, Incertae familiae) from Rudzica near Bielsko-Biała (Outer Carpathians) is described. The new genus differs from other plocoidal and cerioidal stylininas mainly in irregularity in development of septa and the presence of wall developed in advance of septa. Exact locality and geological position of the coral specimen is unknown. Palynological analysis of calcareous sandstone forming a thin coat around the coral specimen allowed age determination. 65 species (including 21 in open nomenclature) of dinoflagellate cysts were recognized. Co-occurrence of *Cepadinium ventriosum* and *Phoberocysta neocomica* indicate the latest Barremian–Early Aptian age of this deposit. The coral was synchronically or penesynchronically redeposited from shallow water environment to flysch basin. Age and lithology of the sediment coating the specimen suggest the Grodziszcze Sandstones as coral-bearing deposits.

Abstrakt: W pracy opisano kolonijnego koralowca sześciopromiennego (Scleractinia) *Nowakocoenia cieszynica* gen. et sp. nov. (podrząd Stylinina, Incertae familiae) pochodzącego z Rudzicy koło Bielska-Białej (Karpaty zewnętrzne). Spośród innych plokoidalnych i cerioidalnych styllininów nowy rodzaj wyróżnia się przede wszystkim nieregularnym rozwojem septów oraz obecnością ściany wyprzedzającej w rozwoju septa. Dokładna lokalizacja oraz pozycja geologiczna okazu nie jest znana. Określenie wieku umożliwiła analiza palinologiczna wapnistego piaskowca tworzącego cienką powłokę wokół kolonii. Stwierdzono zespół 65 gatunków dinocyst (w tym 21 w nomenklaturze otwartej). Współwystępowanie gatunków *Cepadinium ventriosum* i *Phoberocysta neocomica* wskazuje na najpóźniejszy barrem–wczesny apt. Kolonia koralowca została synchronicznie lub penesynchronicznie redeponowana ze środowiska płytkowodnego do basenu fliszowego. Wiek i litologia piaskowca oblekającego kolonię koralowca sugerują, że osad ten reprezentuje piaskowce grodziskie.

Key words: Scleractinian coral, dinocysts, Barremian–Aptian, Polish Outer Carpathians.

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INTRODUCTION

The specimen of scleractinian coral *Nowakocoenia cieszynica* gen. et sp. nov. described in this paper was found in the 1970s in the village Rudzica located approximately 11 km west of Bielsko-Biała (Outer Carpathians, Cieszyn Silesia; Fig. 1) by late Dr. Wiesław Nowak, a geologist and biostratigrapher of the Polish Carpathians. The specimen was given by W. Nowak to Professor Elżbieta Morycowa. Unfortunately exact locality and geological position of the specimen is unknown.

Rudzica is located in the tectonically disturbed area at the fringe of the Cieszyn Nappe (Silesian Unit) overthrusting on strongly folded deposits traditionally regarded as Sub-Silesian Nappe (e.g., Książkiewicz, 1977). The Silesian Unit is formed in Rudzica area by the Lower Cieszyn Shales, Cieszyn Limestones and Upper Cieszyn Shales (Tithonian–Valanginian/Hauterivian) (Burtanówna *et al.*, 1937; Nowak, 1966). In the geological map of discussed area (Nowak, 1966) the Sub-Silesian Unit is formed by some thrust-sheeds of the Cretaceous–Tertiary deposits (Fig. 2). According to Wójcik *et al.* (1999) at the fringe of the Silesian overthrust in Andrychów region there are outcrops of deposits forming olistostrome complex within the folded Miocene (working name: Roczyny–Andrychów Unit). Individual olistoliths of the Carpathian flysch are the Early Cretaceous to Early Miocene age. Previously these deposits have been regarded as the Carpathian flysch and re-

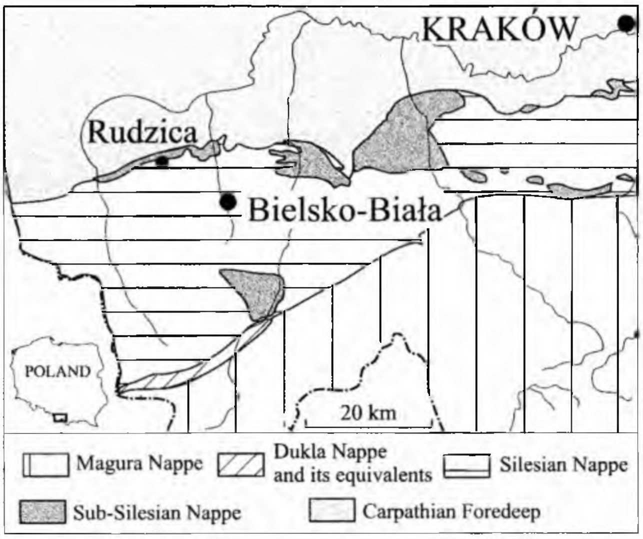


Fig. 1. Location and general geological sketch map (after Książkiewicz, 1977) of Rudzica area

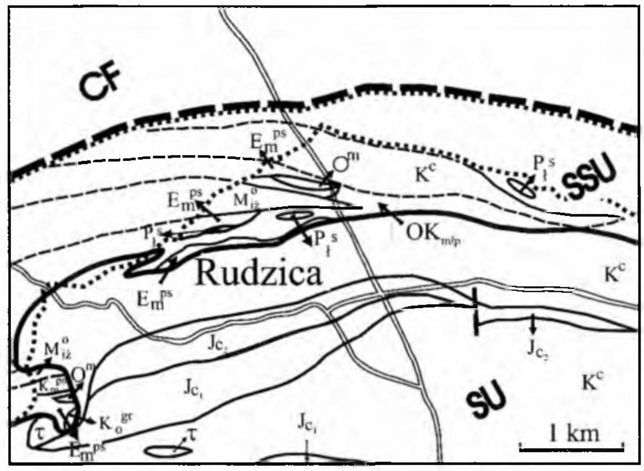


Fig. 2. Geological map of Rudzica area (after Nowak, 1966). τ – Teschenite sills; Kimmeridgian ?, Tithonian–Berriasian: Jc_1 – Lower Cieszyn Shales, Jc_2 – Cieszyn Limestones; Valanginian–Aptian: K^c – Upper Cieszyn Shales, K_o^{gr} – Grodziszcze Sandstones; K_m^{ps} – variegated marls with intercalations of green marls (Turonian–Senonian); OK_{mtp} – undivided deposits of Sub-Silesian Unit (Cretaceous–Tertiary); P_f^s – Upper Istebna Beds (Palaeocene); E_m^{ps} – variegated marls (Eocene); O^m – Menilite Beds (Oligocene); $M_{iż}^o$ – clays, arenaceous clays with intercalations of clayey gravelstones (with fragments of flysch deposits) (Miocene). SU – Silesian Unit; SSU – Sub-Silesian Unit; CF – Carpathian Foredeep. Major tectonic boundaries: certain - drown as continuous line; uncertain -discontinuous line. Area without data concerning pre-Quaternary deposits is marked by dotted line

lated to the Sub-Silesian Unit. It is expected that the Roczyny–Andrychów Unit occurs also in the western part of the Polish Carpathians from Andrychów to Cieszyn (Wójcik *et al.*, 1999).

MATERIAL AND METHODS

The coral colony, partially strongly silicified, is surrounded by up to 25 mm coating of dark-greyish coarse-grained calcareous sandstone (Fig. 3). Ten thin sections of the coral were prepared for observation under transmitted light microscope. Supplementary SEM observations were made. 10G-sample was taken from the deposit closest to the coral. It was processed following the standard palynological procedure: dissolving in 40% HCl and 38% HF, sieving through a 15 μm sieve and centrifuging in the heavy liquid ($ZnCl_2$ + HCl, density 2 g/cm^3). Glycerine-gelatine jelly was used as a mounting medium. Palynofacies analysis was based on qualitative and quantitative analysis of several phytoclast and palynomorph groups (see Batten, 1996).

Coral taxonomy was made by B. Kołodziej and palynological analysis of the coral-bearing deposits by E. Gedl. The described material is housed in the Institute of Geological Sciences of Jagiellonian University.

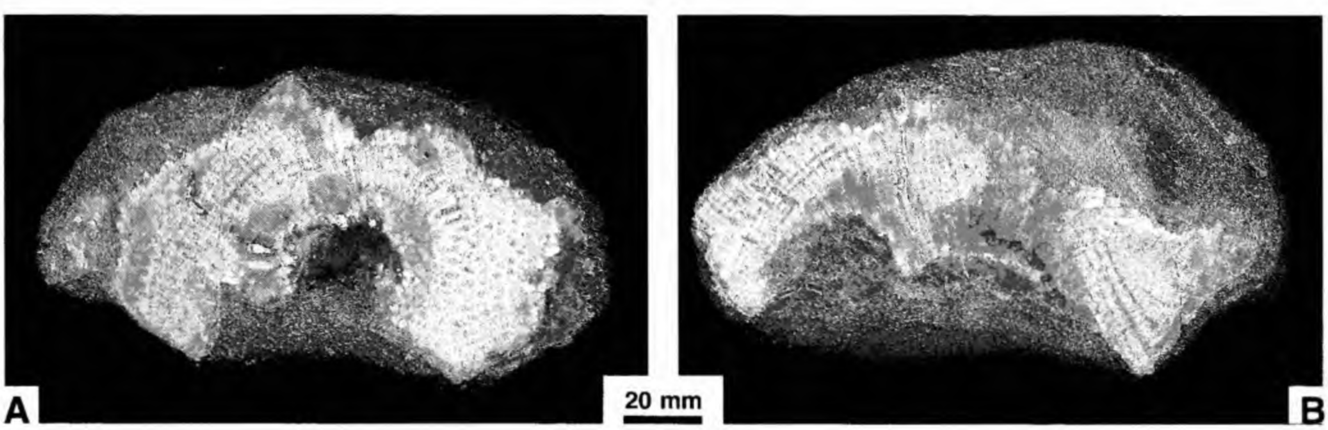


Fig. 3. **A, B.** Scleractinian coral *Nowakocoenia cieszynica* gen. et sp. nov., Rudzica (UJ 148 P) surrounded by thin coat of sandstone, from which sample for palynological analysis was taken

AGE

Age of coral-bearing deposits

Palynological analysis of the coral-bearing deposits evidenced highly diversified dinocyst assemblage that allowed age determination. Among 260 counted specimens 65 species (including 21 species in open nomenclature) belonging to 41 genera were recognized (see Appendix).

Presence of *Prolixosphaeridium parvispinum* (Deflandre, 1937b) Davey *et al.*, 1969 (Fig. 4 I) and *Odontochitina operculata* (O. Wetzel, 1933a) Deflandre & Cookson, 1955 (Fig. 4 L), both known to have FOs in Vandenheckii ammonite Chronozone (De Reneville & Raynaud, 1981; Leereveld *et al.*, 1995; Wilpshaar, 1995), suggest the age of the studied sample not older than the Late Barremian. *Cepadinium ventriosum* (Alberti,, 1959b) Lentin & Williams, 1989 (Figs 4 B, E; 5 D) has been described from Early Aptian deposits by Duxbury (1983), but its FO reported by Lister & Batten (1988) is the latest Barremian (*P. bidentatum* ammonite Zone). This taxon became extinct within *T. bowerbankii* ammonite Zone (Duxbury, 1983).

Last occurrences of *Pseudoceratium pelliferum* Gocht, 1957 (Fig. 4 J, K), a taxon which is also present in the studied dinocyst assemblage, are different in Boreal and Tethyan provinces. Comparison of selected Early Cretaceous dinocyst events in Tethyan and Boreal provinces *vs* ammonite zonation (after Leereveld *et al.*, 1995) is shown on Table 1. *Pseudoceratium pelliferum* has its LO in the Tethyan realm at the top of the Sarasini ammonite Chronozone (Wilpshaar, 1995), whereas it continues until the top of the *D. deshayesi* ammonite Zone in the Boreal realm. Skupien (1997), who described similar dinocyst assemblage from the Těšín–Hradište Formation of the Silesian Unit (Czech Carpathians), noted the presence of *Pseudoceratium pelliferum* in the interval dated on the basis of ammonites as the Late Barremian to Early Aptian (Vašícek, 1981).

Phoberocysta neocomica (Gocht, 1957) Lentin & Williams, 1993 (Fig. 4 C, F) has its LO at the top of *D. forbesi* ammonite Zone (Duxbury, 1983). *Membranosphaera* sp. A *sensu* Davey, 1979 (Fig. 4 G, H) has been described from the Boreal Early Aptian (Northern Bay of Biscay). This taxon was also found in the uppermost Barremian–lowermost Aptian deposits of Western Carpathians (Skole Nappe, Poland; Gedl, 1999). Two taxa, *Cymososphaeridium validum* Davey, 1982b and *Systematophora palmula* Davey, 1982b, are probably reworked from older rocks (Hauterivian ?; Valanginian ?).

The presence of typical of Boreal province dinocyst taxa in studied material makes possible to use Boreal dinocyst stratigraphic scheme for age assignment of the sample.

All these data suggest the conclusion that the age of the studied sample is the latest Barremian (*P. bidentatum* ammonite Zone) – Early Aptian (*D. forbesi* ammonite Zone).

Table 1

Comparison of selected Early Cretaceous dinocyst events *vs* amonite zonation in Tethyan and Boreal provinces (after Leereveld *et al.*, 1995; modified). FO – first occurrence; LO – last occurrence

Stages	Substages	Tethyan ammonite zones	Selected Tethyan dinocyst events FOs	Selected Tethyan dinocyst events LOs
Aptian	M	E. subnodoso-costatum		
Aptian	L	D. furcata		
Aptian	L	D. deshayesi		
Aptian	L	D. weissi		
Aptian	L	D. tuarkyricus		
Barremian	U	M. sarasini		P. pelliferum; P. neocomica
Barremian	U	I. giraudi		
Barremian	U	H. feraudianus		
Barremian	U	H. sartousiana		
Barremian	U	A. vandenheckii	P. parvispinum; O. operculata	
Barremian	L	H. caillaudianus	P. retusum s.l.; T. tabulata	
Barremian	L	S. nicklesi		
Barremian	L	S. hugii		

Selected Boreal dinocyst events FOs	Selected Boreal dinocyst events LOs	Boreal ammonite zones	Substages	Stages
		E. martinioides	M	Aptian
	C. ventriosum	T. bowerbanki	L	Aptian
	P. pelliferum	D. deshayesi	L	Aptian
	P. neocomica	D. forbesi	L	Aptian
		P. fissicostatus	L	Aptian
C. ventriosum		P. bidentatum	U	Barremian
		S. stolleyi	U	Barremian
		S.pingue/ "A." innexum	U	Barremian
		P. denckmanni	U	Barremian
P. parvispinum; O. operculata; T. tabulata; P. retusum s.l.		P. elegans	L	Barremian
		"H." fissicostatum	L	Barremian
		"H." rarocinctum	L	Barremian
		S. variabilis	L	Barremian

Age of the studied sample

Age of coral

The specimen of *Nowakocoenia cieszynica* is closely embedded in sandstone filling intracalicular space of some corallites in the outer part of the colony which shows no major damage by erosion before burial. It suggests the same age of the coral and the coral-bearing sediment.

Up to now the only corals known from the Cieszyn Silesia area come from exotic boulders of the Štramberk-type limestone (Upper Tithonian–Lower Berriasian) occuring within flysch deposits (Ogilvie, 1897; Roniewicz & Morycowa, 1988; Morycowa & Roniewicz, 1990; Kołodziej, 1997). In contrary to corals from the Štramberk facies the studied colony is not embedded in limestone matrix and the specimen shows completely different state of preservation. General appearance and state of preservation of the discussed specimen resembles in general the Early Cretaceous corals known from the Polish Flysch Carpathians. About 70 species of the Barremian–Aptian (only one Hauterivian specimen) scleractinian corals were described from conglomerates belonging to the Grodziszcze Beds from the vicinity of Lanckorona, Wadowice (Sub-Silesian Unit), Wieliczka and Tuchów (Silesian Unit) (Morycowa, 1964). Early Cretaceous corals are also known from the Veřovice Beds of the Silesian Unit from Lanckorona (Prof. E. Morycowa, pers. comm., 1999).

It seems probable that the discussed specimen, similarly as corals from the Grodziszcze Beds (Morycowa, 1964), was synchronically or penesynchronically redeposited from shallow water environment to the deeper part of a flysch basin.

Outcrops of Grodziszcze and Veřovice Beds with corals of Hauterivian–Aptian age are more than 40 km east of Rudzica. Scleractinian corals of this age were not known from Cieszyn Silesia area up to now.

CORAL-BEARING DEPOSIT – DISCUSSION

Upper Barremian–Lower Aptian deposits of the Sub-Silesian and Silesian Unit are developed as the Veřovice Beds, the Grodziszcze Sandstones and the Barwałd Beds (Bieda *et al.*, 1963; Koszarski & Ślączka, 1976; Leszczyński & Malik, 1996). Lithology of the sediment coating the coral specimen suggest that it represents the Grodziszcze Sandstones (P. Nescieruk, M.Sc., Dr. A. Wójcik, pers. comm., 1999).

Palynologiacal analysis shows that organic residuum (particles >15 μm) consists of rich and diversified palynomorph assemblage. It is composed of 48% black opaque phytoclasts and 16% brown phytoclasts, 14% sporomorphs, 13% amorphic matter, 7% dinocysts and 2% cuticles (Fig. 6).

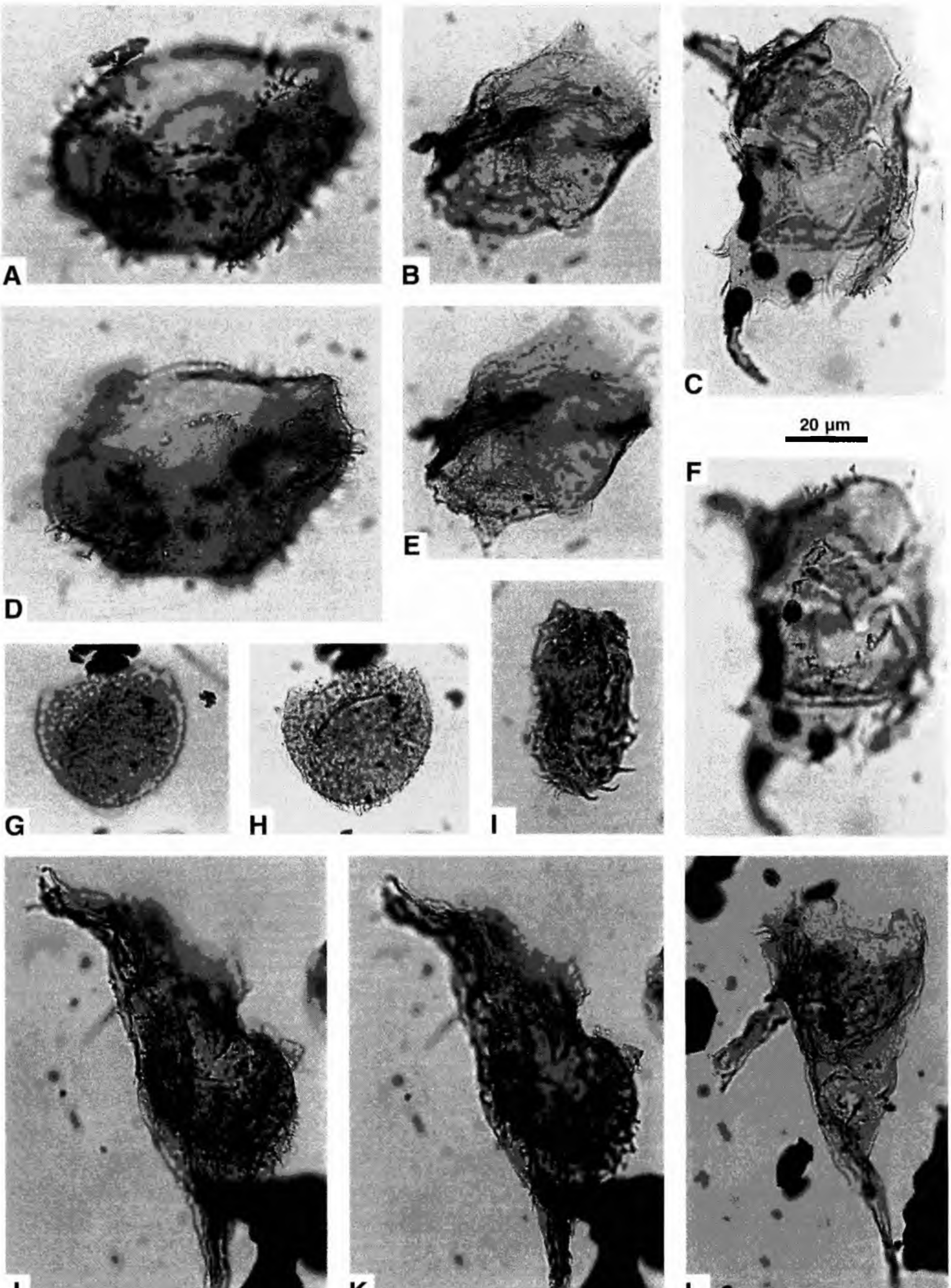
Analysis of dinocyst eco-groups (e.g., Leereveld, 1995) indicates that neritic taxa [*Oligosphaeridium*, *Spiniferites*, *Achomosphaera* (Fig. 5 H)] are the most frequent (Fig. 7) and represent 32% of the whole dinocyst assemblage. Only two specimens of *Pterodinium*, an oceanic dinocyst, and few of outer neritic specimens (*Chlamydophorella*) were found (1–2%). More numerous are the representatives of inner neritic (*Cribroperidinium*, 5%) and littoral dinocysts [*Pseudoceratium* (Figs 4 J, K; 5 B), *Circulodinium*, *Canningia*; 7%]. Low-salinity taxa: *Muderongia* (Figs 4 C, F; 5 A), *Subtilisphaera* (Fig. 5 C, G) and *Odontochitina* (Fig. 4 L) are relatively frequent (9%). Diversity of dinocysts, which usually tends to increase seaward, is high in the studied assemblage. Palynofacies is diversified, however land-derived components (sporomorphs, cuticles, brown phytoclasts) predominate marine ones (dinocysts). It may suggest transport of terrestrial and shallow-water material into deeper part of the basin.

It is not possible to determine to which tectonic unit the coral-bearing deposits belong because of unknown exact locality of the studied specimen. Small outcrops of the Grodziszcze Sandstone belonging to the Sub-Silesian Unit in Roztropice (3 km SW of Rudzica) at the fringe of the Silesian overthrust were localised on geological map by Nowak (1966). The Grodziszcze Sandstone of the Sub-Silesian Unit were also found by this author in Janowice near Bestwiny (12 km NE from Rudzica) (see Kamieński *et al.*, 1963). Recent field work did not document the presence of the Grodziszcze Sandstone in Rudzica vicinity. This area is strongly disturbed tectonically and because of that it is not excluded that these deposits may occur there (P. Nescieruk, M. Sc., Dr. A. Wójcik, pers. comm., 1999).

Barremian–Aptian deposits of the Silesian Unit are developed as the Veřovice Beds more commonly than in the Sub-Silesian Unit (see litostratigraphy compiled by Bieda *et al.*, 1963 and Leszczyński *in*: Leszczyński & Malik, 1996).

The presented discussion allow only to speculate that the studied coral comes from the Grodziszcze Sandstones of the Sub-Silesian Unit. Following the interpretation of Wójcik *et al.* (1999) the Grodziszcze Sandstones might occur in this region as olistoliths within folded Miocene.

Fig. 4. Barremian–Aptian dinocysts of the coral-bearing deposits, Rudzica. **A, D.** *Tenua tabulata* (Davey & Verdier, 1974) Below, 1981a [RII/1; J43/3]; **B, E.** *Cepadinium ventriosum* (Alberti,, 1959b) Lentin & Williams, 1989 [RII; K27/2]; **C, F.** *Phoberocysta neocomica* (Gocht, 1957) Lentin & Williams, 1993 [RII/2; U49/0]; **G, H.** *Membranosphaera* sp. A *sensu* Davey, 1979 [RI/b; S44/1]; **I.** *Prolixosphaeridium parvispinum* (Deflandre, 1937b) Davey *et al.*, 1969 [RII/2; O37/1]; **J, K.** *Pseudoceratium pelliferum* Gocht, 1957 [RII/2; G42/2]; **L.** *Odontochitina operculata* (O. Wetzel, 1933a) Deflandre & Cookson, 1955 [RII; B43/2]. Scale bar indicates 20 μm and refers to all figures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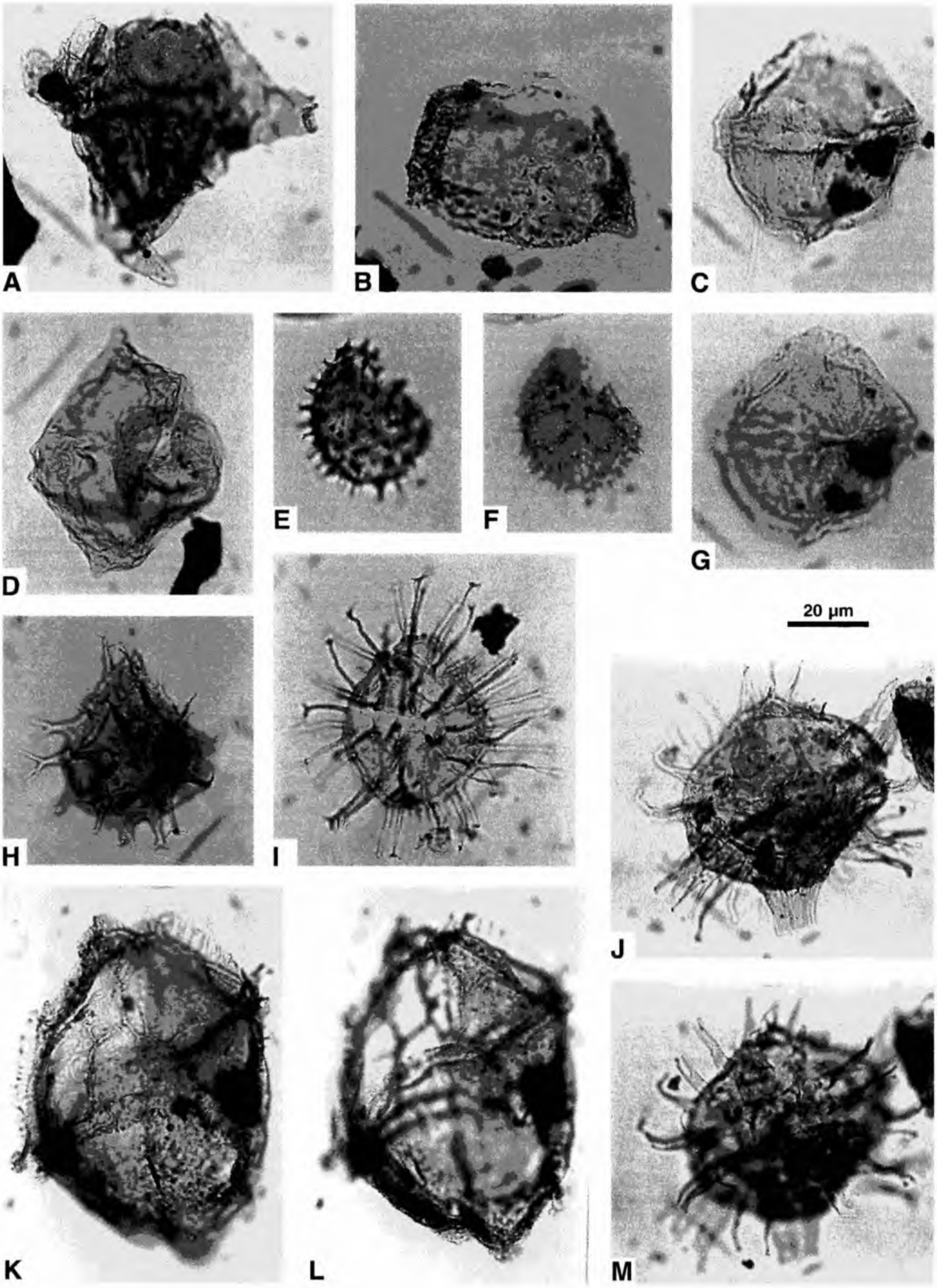
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SYSTEMATIC PALEONTOLOGY

Order SCLERACTINIA Bourne, 1900
Suborder STYLININA Alloiteau, 1952

Incertae familiae

Genus *Nowakocoenia* Kołodziej nov. gen.

Type species: *Nowakocoenia cieszynica* gen. et sp. nov.
Etymology: Patronymic, in honour of late Dr. Wiesław Nowak.
Diagnosis: Colony subplocoid and plocoid; in some places cerioid. Septa developed regularly (in four sectors) or irregularly. In some corallites septa are very poor developed or even absent. Regularly developed septal apparatus is following: in two bigger sectors 6 septa occur (1 S1 + 2 S2 + 3 S3); in two smaller ones 4 septa are developed (1 S1 + 1 S2 + 2 S3). Wall developed in advance of septa or showing septo-parathecal appearance. Endotheca tabular and subtabular. Exotheca, if developed, vesiculous. Budding intercalicular and septal.
Species included: *Nowakocoenia cieszynica* gen. et sp. nov.
Occurrence: Rudzica near Bielsko-Biała (Outer Carpathians, Poland).
Stratigraphic distribution: Latest Barremian–Early Aptian.
Remarks: A new genus in general structure (e.g., subplocoid/plocoid – cerioid colony, tabular-subtabular endotheca, lack of columella) resembles such taxa from the suborder Stylinina as *Cyathophora* Michelin, 1843, *Pseudocoenia* d'Orbigny, 1850, *Pentacoenia* d'Orbigny, 1850, *Holocystis* Lonsdale, 1848 and *Bilaterocoenia* Morycowa, 1974 (for general discussion of these genera see e.g., Morycowa, 1971; Eliašová, 1981; Löser, 1994). These taxa were usually placed into the family Cyathophoridae Vaughan et Wells, 1943. However, the study by E. Morycowa & E. Roniewicz (in prep.) shows that due to microstructural disparity (non-trabecular microstructure), lack of auriculae and reduction of septal blades to amplexoid form, the family Cyathophoridae should be removed from the suborder Stylinina. The family Cyathophoridae was provisionally placed by Morycowa & Masse (1998) in the suborder Incertae sedis. These authors placed genera *Pseudocoenia*, *Pentacoenia*, *Holocystis* and *Bilaterocoenia* in the family Stylinidae, subfamily Pseudocoeniinae (suborder Stylinina). However, such systematical position of *Bilaterocoenia* and *Holocystis* seems to be questionable due to lack of auriculae. Lack of auriculae in the new genus make it closer to these two later genera. Important feature differentiating the new genus from *Bilaterocoenia* and *Holocystis* is the character of the wall. The character of wall in the new genus is ambiguous, however at least in some places of the colony, is developed in advance to septa. In other discussed taxa the wall is septo- or parathecal. The presence of the wall developed in advance to septa is an unquestionable feature in many corallites. It is possible then, that the wall of septothecal or parathecal appearance is in fact in structural continuity with septa. If the presence of trabeculae in the wall (see description of a new species) was confirmed, this type of wall could be determined as trabeculotheca (*sensu* Stolarski, 1995). It is suggested by the presence of the midseptal line in interseptal wall segments. However, poorly preserved microstructure does not allow to describe the wall of the studied specimen as the wall of trabecular type. It is worth to notice that as shown by Mori *et al.* (1977) the eutheca (prototheca) walls are sometimes erroneously described as septotheca.

The septa in *Holocystis* are also developed in four sectors, but the septal pattern is regularly and different than in the new genus.

Nowakocoenia gen. nov. is placed in the family Incertae sedis because of difficulties in wall character interpretation due to poorly preserved microstructure. It is possible that *Nowakocoenia* gen. nov. should be placed in a new family.

Nowakocoenia cieszynica Kołodziej gen. et sp. nov.
Figs 3, 8, 9

Holotype: UJ 148 P; thin sections: UJ 31/1-10.
Type horizon: Latest Barremian–Early Aptian.
Type locality: Rudzica (Outer Carpathians, Poland).
Etymology: From the region of origin (Cieszyn Silesia).
Diagnosis: Calice diameter 1.5–3 mm; distance between corallite centres 1.5–4 mm; number of septa from 0 to 20, number of tabulae 9–12 on 5 mm.
Material: 1 specimen: UJ 148 P, 10 thin sections: UJ 31/1-10.
Measurements (mm):

colony diameter	ca 70 x 140
colony height	ca 50
diameter of calice (lumen)	1.5–3
distance between corallite centres	1.5–4
density of endothecal elements	9–12 on 5 mm
width of peritheca (if present)	up to 1
number of septa	0–20

Description: Colony massive, subplocoid and plocoid; in some places of colony cerioid. Corallites subcircular or circular (mostly in subplocoid and plocoid part of colony) or polygonal mostly quadrangular and pentagonal (in cerioidal part of colony). Septa developed as septal blades, nonconfluent or subconfluent. Septal apparatus variable. Some corallites, particularly in subplocoid/plocoid parts of colony, show regular septal pattern. Septa differentiated into three size orders developed in four sectors: 1 S1 + 2 S2 + 3 S3 occur in two bigger sectors; 1 S1 + 1 S2 + 2 S3 occur in two smaller ones. Incomplete systems frequent, particularly in cerioid portions of colony, where septa are poorly and irregularly developed or even are absent. Length of septa variable. Longest septa S1 attain $^{1}/_{4}$–$^{1}/_{3}$ of calice diameter. S1 and especially S2 and S3 undergrown in some corallites. Septal faces without ornamentation. Endotheca tabular and subtabular. Exotheca, if developed, vesicular. Budding intracalicular and rarely septal. Wall character difficult to estimate. The wall of some corallites developed in advance of septa (structural continuity of septa and wall); in the others it shows septo-parathecal appearance.
Microstructure: Skeleton microstructure is poorly preserved and ambiguous. Microstructure resembling medium-sized and thick trabeculae is visible in some parts of the wall. On the other hand midline in the wall and septa suggesting fibrous or mini-trabecular microstructure is present in some corallites. Short septa are built of fibres which are in continuity with the wall (trabeculae?). Micro-

Fig. 5. Barremian-Aptian dinocysts of the coral-bearing deposit, Rudzica. **A.** *Muderongia pariata* Duxbury, 1983 [RI/b; D49/1]; **B.** *Pseudoceratium retusum* Brideaux, 1977 [RII; N34/3]; **C, G.** *Subtilisphaera terrula* (Davey, 1974) Lentin & Williams, 1976 [RI/b; Q45/2]; **D.** *Cepadinium ventriosum* (Alberti, 1959b) Lentin & Williams, 1989 [RII/1; U48/1]; **E, F.** *Taleisphaera* cf. *T. hydra* Duxbury, 1979a [RII/1; C37/1]; **H.** *Achomosphaera verdieri* Below, 1982c [RII/1; S40/2]; **I.** *Kiokansium unituberculatum* (Tasch in Tasch *et al.*, 1964) Stover & Evitt, 1978 [RII/1; H48/1]; **J, M.** *Florentinia interrupta* Duxbury, 1980 [RI/b; B36/0]; **K, L.** *Rhynchodiniopsis aptiana* Deflandre, 1935 [RI/b; D48/1]. Scale bar indicates 20 μm and refers to all figures

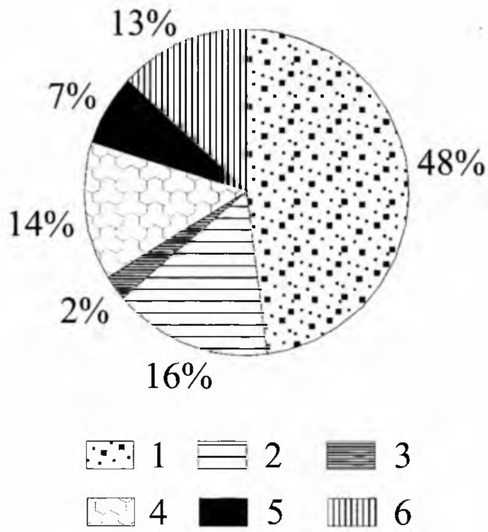

Fig. 6. Palynofacies assemblage: *1* – black opaque phytoclasts; *2* – brown phytoclasts; *3* – cuticles; *4* – sporomorphs; *5* – dinocysts; *6* – amorphic organic matter

structure of the discussed specimen can not be univocally determined because some of observed microstructural features can be of diagenetic origin.

Occurrence: Poland – Outer Carpathians: Rudzica (latest Barremian–Early Aptian).

CONCLUSIONS

1. Colonial scleractinian coral *Nowakocoenia cieszynica* gen. et sp. nov. (suborder Stylinina, family uncertain) differs from other plocoidal and cerioidal stylininas mainly in peculiar development of septal apparatus.

2. Palynological analysis of calcareous sandstone forming coat around the coral specimen allow to recognize 65 species of dinocysts (including 21 in open nomenclature). Co-occurrence of *Cepadinium ventriosum* and *Phoberocysta neocomica* indicate the latest Barremian–Early Aptian age of the deposit.

3. The coral specimen was synchronically or penesynchronically redeposited from shallow water environment to outer (?) neritic zone of flysch basin. Age and lithology of sandstone coating the specimen suggest the Grodziszcze Sandstone as its rock of origin.

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Dr. Przemysław Gedl is acknowledged for critical comments and discussion on manuscript, and Dr. Michał Krobicki for editorial help.

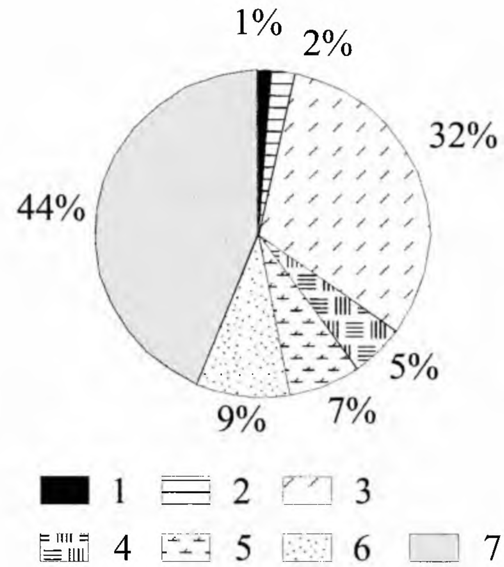


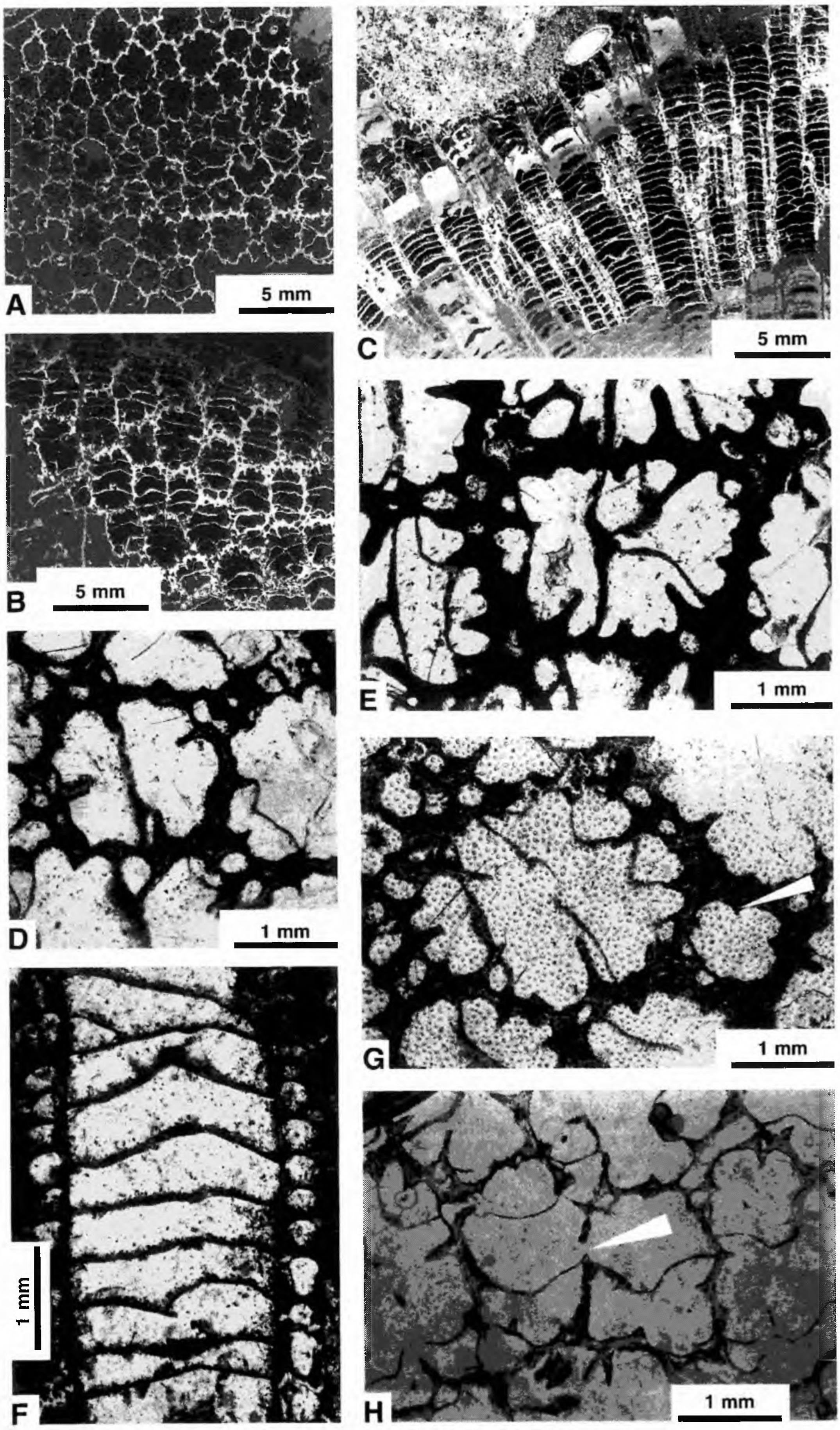
Fig. 7. Dinocyst eco-groups (Leereveld, 1995) *vs* dinocyst assemblage: *1* – oceanic; *2* – outer neritic; *3* – neritic; *4* – inner neritic; *5* – littoral; *6* – low-salinity; *7* – other dinocysts

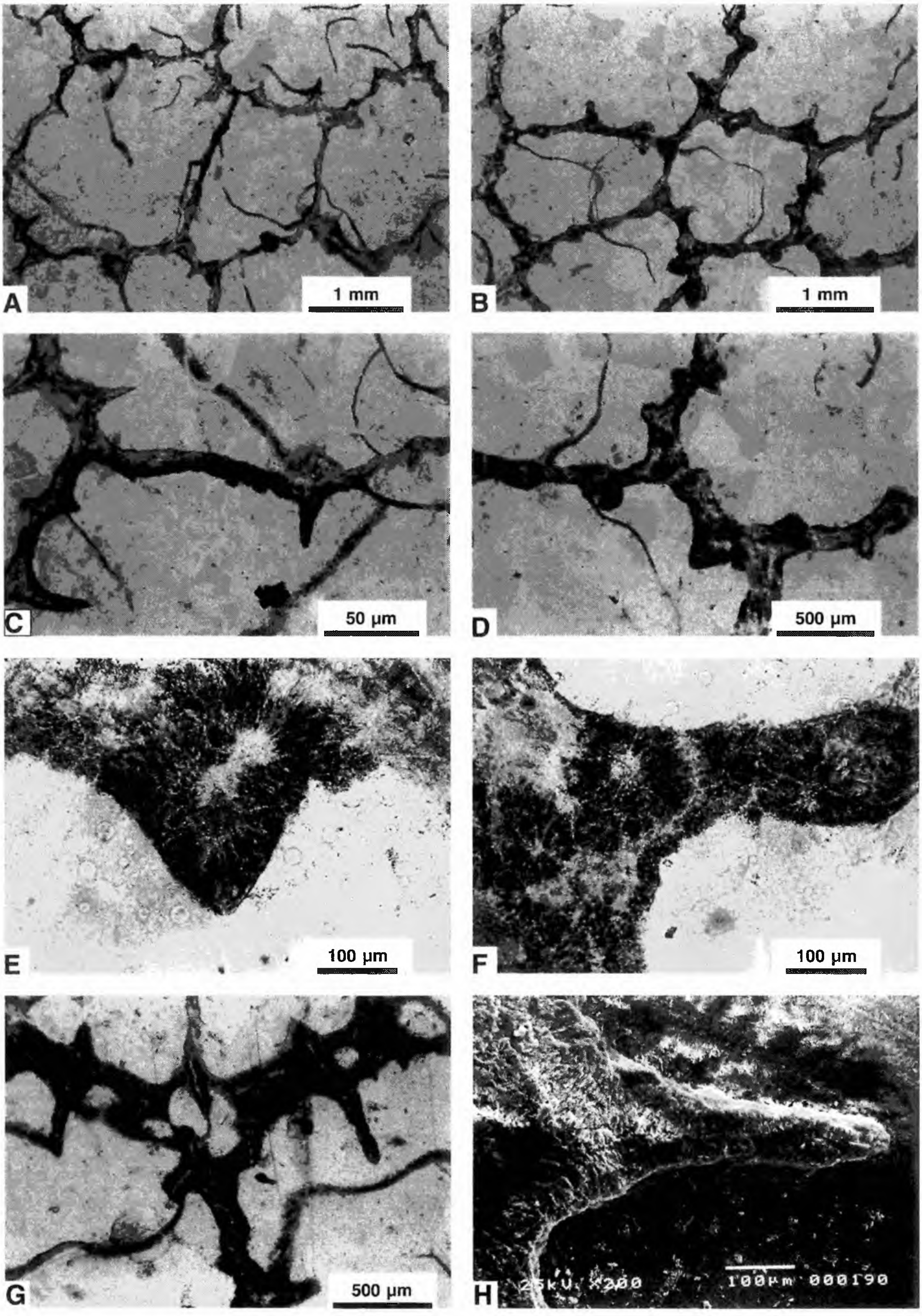
APPENDIX

Index of dinocyst taxa found in the sample is provided below in alphabetical order. Taxonomic citations can be found in Williams *et al.* (1998). Number of dinocyst specimens is given in brackets. All slides are housed in the author's collection (Institute of Geological Sciences, Jagiellonian University).

Achomosphaera verdieri Below, 1982c; [2]; **Fig. 5 H**
Batiacasphaera sp.; [6]
Callaiosphaeridium asymmetricum (Deflandre & Courteville, 1939) Davey & Williams, 1966b; [9]
Canningia sp.; [1]
Cassiculosphaeridia reticulata (Davey, 1969a) Courtinat, 1989; [2]
Cepadinium ventriosum (Alberti, 1959b) Lentin & Williams, 1989; [6]; **Figs 4 B, E; 5 D**
Chlamydophorella nyei Cookson & Eisenack, 1958; [4]
Circulodinium distinctum (Deflandre & Cookson, 1955) Jansonius, 1986; [1]
Circulodinium sp.; [5]
Cometodinium ?comatum S.K. Srivastava, 1984; [3]
Cribroperidinium sp.; [12]
Cymososphaeridium validum Davey, 1982b; [1]
Dapsilidinium ?deflandrei (Valensi, 1947) Lentin & Williams, 1981; [1]

Fig. 8. Scleractinian coral *Nowakocoenia cieszynica* gen. et sp. nov., Rudzica, UJ 148 P. **A**, **B**. Transverse section; **C**. Longitudinal section; **D**. Juvenile stage of corallite with well marked four sectors; **E**. Corallite with 1 S1 + 2 S2 + 3 S3 in two sectors and 1 S1 + 1 S2 + 2 S3 in two other sectors; **F**. Endotheca and exotheca in longitudinal section; **G**. Perithecal budding (arrow; small bubbles are artefact); **H**. Septal budding (arrow)


A
5 mm
B
5 mm
C
5 mm
D
1 mm
E
1 mm
F
1 mm
G
1 mm
H
1 mm


A
1 mm
B
1 mm
C
50 µm
D
500 µm
E
100 µm
F
100 µm
G
500 µm
H
100µm

Dapsilidinium sp.; [1]
Discorsia nannus (Davey, 1974) Duxbury, 1977; [1]
Eyrea nebulosa sensu Below, 1984; [1]
Florentinia interrupta Duxbury, 1980; [3]; **Fig. 5 J, M**
Gonyaulacysta sp.; [1]
Hystrichosphaerina schindewolfii Alberti, 1961; [4]
Kiokansium sp.; [14]
Kiokansium unituberculatum (Tasch in Tasch et al., 1964) Stover & Evitt, 1978; [4]; **Fig. 5 I**
Kleithriasphaeridium eoinodes (Eisenack, 1958a) Davey, 1974; [4]
Kleithriasphaeridium sp.; [1]
Membranosphaera sp. A *sensu* Davey, 1979; [2]; **Fig. 4 G, H**
Muderongia pariata Duxbury, 1983; [1]; **Fig. 5 A**
Odontochitina operculata (O. Wetzel, 1933a) Deflandre & Cookson, 1955; [1]; **Fig. 4 L**
Oligosphaeridium ?asterigerum (Gocht, 1959) Davey & Williams, 1969; [4]
Oligosphaeridium complex (White, 1842) Davey & Williams, 1966b; [34]
Oligosphaeridium perforatum (Gocht, 1959) Davey & Williams, 1969;[3]
Oligosphaeridium poculum Jain, 1977b; [1]
Oligosphaeridium pulcherrimum (Deflandre & Cookson, 1955) Davey & Williams, 1966b; [4]
Oligosphaeridium sp.; [11]
Oligosphaeridium vasiforum (Neale & Sarjeant, 1962) Davey & Williams, 1966b; [1]
Oligosphaeridium verrucosum Davey, 1979b; [2]
Ovoidinium diversum Davey, 1979b; [8]
Palaeotetradinium silicorum Deflandre, 1936b; [1]
Pareodinia sp.; [2]
Phoberocysta neocomica (Gocht, 1957) Lentin & Williams, 1993; [18]; **Fig. 4 C, F**
Prolixosphaeridium parvispinum (Deflandre, 1937b) Davey *et al.*, 1969; [10]; **Fig. 4 I**
Prolixosphaeridium sp.; [1]
Pseudoceratium pelliferum Gocht, 1957; [3]; **Fig. 4 J, K**
Pseudoceratium retusum Brideaux, 1977; [6]; **Fig. 5 B**
Pseudoceratium sp.; [1]
Pterodinium cingulatum (O. Wetzel, 1933b) Below, 1981a; [1]
Pterodinium sp.; [1]
Rhynchodiniopsis aptiana Deflandre, 1935; [1]; **Fig. 5 K, L**
Rhynchodiniopsis fimbriata (Duxbury, 1980) Sarjeant, 1982b; [1]
Scriniodinium sp.; [1]
Sentusidinium sp.; [1]
Spiniferites sp.; [22]
Subtilisphaera perlucida (Alberti, 1959b) Jain & Millepied, 1973; [1]
Subtilisphaera terrula (Davey, 1974) Lentin & Williams, 1976; [2]; **Fig. 5 C, G**
Surculosphaeridium sp.; [2]
Surculosphaeridium trunculum Davey, 1979b; [5]
Systematophora complicata Neale & Sarjeant, 1962; [1]
Systematophora palmula Davey, 1982b; [1]
Systematophora sp.; [2]
Taleisphaera hydra Duxbury, 1979a; [8]
Taleisphaera cf. *T. hydra* Duxbury, 1979a; [1]; **Fig. 5 E, F**
Tanyosphaeridium isocalamum (Deflandre & Cookson, 1955) Davey & Williams, 1969; [1]
Tanyosphaeridium sp.; [1]
Tenua tabulata (Davey & Verdier, 1974) Below, 1981a; [3]; **Fig. 4 A, D**
Trichodinium sp.; [1]
Wallodinium krutzschii (Alberti, 1961) Habib, 1972; [1]
Wrevittia ?diutina subsp. *diutina* (Duxbury, 1977) Helenes and Lucas-Clark, 1997; [1]

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Fig. 9. Scleractinian coral *Nowakocoenia cieszynica* gen. et sp. nov., Rudzica, UJ 148 P. All figures in transverse sections. **A, B**. Corallites with poorly and irregularly developed septal apparatus; **C, D**. Fragment of corallite showing the wall developed in advance of septa; **E**. Enlargment of fig. D. Short septa built of fibres which are in continuity with the wall (trabeculae?); **F**. Thick trabeculae (?) of the wall; **G**. Fragment of corallite with middle line visible in septa and wall; **H**. Microstructure of septum in SEM view

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Streszczenie

KORALOWIEC *Nowakocoenia cieszynica* gen. et sp. nov. I JEGO WIEK W OPARCIU O DINOCYSTY (BARREM–APT, POLSKIE KARPATY ZEWNĘTRZNE)

Bogusław Kołodziej & Elżbieta Gedl

W pracy opisano kolonijnego koralowca sześciopromiennego (Scleractinia) *Nowakocoenia cieszynica* gen. et sp. nov. Okaz został znaleziony w latach siedemdziesiątych przez doc. Wiesława Nowaka w Rudzicy położonej ok. 11 na zachód od Bielska-Białej (Karpaty zewnętrzne) (Fig. 1, 2).

Nowy rodzaj (Fig. 3, 8, 9). zaliczono do rodziny Incertae familiae w podrzędzie Stylinina. *Nowakocoenia* wyróżnia się wśród innych plokoidalnych i cerioidalnych styllininów nietypowym rozwojem aparatu septalnego oraz obecnością ściany, która wyprzedza w rozwoju septa. Część koralitów posiada regularny rozwój septów: w dwóch większych sektorach występuje 6 septów (1 S1, 2 S2, 3 S3); w dwóch mniejszych sektorach występują 4 septa (1 S1, 1 S2, 2 S3). W pozostałych koralitach septa są słabo i nieregularnie rozwinięte lub nawet są nieobecne.

Dokładna lokalizacja oraz pozycja geologiczna okazu nie jest znana. Określenie wieku umożliwiła analiza palinologiczna gruboziarnistego, wapnistego piaskowca tworzącego cienką powłokę (do 25 mm) wokół kolonii (Fig. 3). Stwierdzono w niej zespół 65 gatunków dinocyst (w tym 21 oznaczonych w nomenklaturze otwartej) (Fig. 4, 5; Appendix). Formy przewodnie, a zwłaszcza współwystępowanie *Cepadinium ventriosum* (Alberti,, 1959b) Lentin & Williams, 1989 i *Phoberocysta neocomica* (Gocht, 1957) Lentin & Williams, 1993 wskazują, że wiek osadu mieści się w interwale najpóźniejszy barrem–wczesny apt (Tab. 1).

Dotychczas znane koralowce z obszaru Śląska Cieszyńskiego pochodzą z wapieni egzotykowych typu sztramberskiego (tyton–wczesny berias). W przeciwieństwie do nich badany koralowiec nie występuje w obrębie wapiennego matriks. Pod względem stanu zachowania badany okaz jest natomiast bardzo zbliżony do koralowców znanych z warstw grodziskich (barrem–apt, jeden okaz z hoterywu) z okolic Lanckorony, Wadowic (jednostka podśląska), Wieliczki i Tuchowa (jednostka śląska) (Morycowa, 1964). Zewnętrzna część kolonii jest dobrze zachowana, a piaskowiec otaczający kolonię wypełnia również przestrzeń międzyszkieletową w zewnętrznej części kolonii. Sugeruje to, że okaz został synchronicznie lub penesynchronicznie redeponowany ze środowiska płytkowodnego do głębszych partii basenu fliszowego. Analiza palinologiczna osadu wykazała dominację dinocyst charakterystycznych dla strefy nerytycznej (Fig. 6, 7). Wiek i litologia piaskowca oblekającego kolonię koralowca pozwalają sądzić, że osad ten reprezentuje piaskowce grodziskie. Ponieważ dokładna lokalizacja okazu jest nieznana, określenie pozycji tektonicznej utworów, z których pochodzi zbadany koralowiec jest niemożliwe. Wydaje się jednak prawdopodobne, że reprezentują one jednostkę podśląską. Rejon Rudzicy znajduje się na terenie silnie zaburzonym tektonicznie u czoła płaszczowiny cieszyńskiej (jednostka śląska) (Nowak, 1966; Książkiewicz, 1977) (Fig. 2). Według ostatnich badań utwory fliszowe występujące u czoła płaszczowiny cieszyńskiej w tym rejonie, a zaliczane tradycyjnie do jednostki podśląskiej, mogą w rzeczywistości stanowić olistolity utworów jednostki śląskiej i podśląskiej w obrębie sfałdowanych utworów mioceńskich (Wójcik *et al.*, 1999).